CLAIMS

1   1. A graph walking system, comprising:

2   a binding system for binding a graph observer with a data graph, for binding node

3   patterns to node observers to generate at least one node pattern/node observer pair, and for

4   binding the data graph observer to at least one node pattern/node observer pairing, and wherein

5   each node pattern includes a computed set of target sub-node patterns;

6   a node relationship graph (NRG), wherein each node in the NRG corresponds to at least

7   one node in the data graph, and wherein each node in the NRG includes a computed set of valid

8   sub-node patterns;

9   graph walking logic for systematically walking through nodes in the data graph and

10 corresponding nodes in the NRG; and

11   a pattern testing system that determines if the set of target sub-node patterns for a node

12 pattern matches the set of valid sub-node patterns for a corresponding NRG node when a node is

13 encountered in the data graph.

1   2. The graph walking system of claim 1, wherein the set of target sub-node patterns includes at

2   least one generational node pattern.

1   3. The graph walking system of claim 1, further comprising a graph observer pruning system for

2   deactivating a graph observer for sub-node processing when no matches occur between target

3   sub-node patterns and valid sub-node patterns for an encountered node.

1   4. The graph walking system of claim 3, wherein the graph walking logic includes a sub-node

2   pruning system for disabling the graph walking logic when all graph observers for a set of sub-

3   node have been deactivated.

1   5. The graph walking system of claim 1, wherein the graph walking logic stores a list of node

2   pattern/node observer pairs corresponding to matches made by the pattern testing system for

3   each node.

1   6. The graph walking system of claim 5, wherein, for a root node, the pattern testing system tests

2   each target sub-node pattern for all node patterns bound the graph observer, and adds a

3   corresponding node pattern/node observer pair to the list of corresponding node pattern/node

4   observer pairs for the root node.

1   7. The graph walking system of claim 5, wherein, for a child node, the pattern testing system

2   tests each target sub-node pattern associated with the list of node pattern/node observer pairs

3   stored for a parent node.

1   8. The graph walking system of claim 7, wherein the pattern testing system adds a

2   corresponding node pattern/node observer pair to the list of corresponding node pattern/node

3   observer pairs for the child node when a match occurs.

1   9. A system for optimizing a graph walking process of an inputted data graph based on inputted

2   node patterns and a node relationship graph (NRG) that corresponds to the inputted data graph,

3   the system comprising:

4   a system for generating a set of valid sub-node patterns for each node in the NRG;

5   a system for generating a set of target sub-node patterns for each inputted node pattern;

6   a graph processor for systematically walking through nodes within the data graph and

7   corresponding nodes in the NRG; and

8   a pattern testing system that determines if the target sub-node patterns for a node pattern

9   match the valid sub-node patterns for a corresponding node in the NRG when a node is

10   encountered in the data graph.

1   10. The system of claim 9, further comprising a first pruning system that can be instructed by a

2   node observer bound with an associated graph observer to deactivate the associated graph

3   observer for a set of sub-nodes when no matches occur between target sub-node patterns and

4   valid sub-node patterns.

1   11. The system of claim 10, further comprising a second pruning system that can instruct the

2   graph processor not to walk the set of sub-nodes if all graph observers have been deactivated.

1   12. The system of claim 9, wherein the graph processor includes a root node test, wherein the

2   root node test tests all target sub-node patterns.

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1   13. The system of claim 9, wherein the graph processor includes a child node test, wherein the

2   child node test tests only target sub-node patterns associated with node patterns that had at least

3   one match in a parent node.

1   14. A method for analyzing a graph of hierarchical data, comprising the steps of:

2   binding a plurality of graph observers to the graph, wherein each graph observer is

3   further bound to a set of inputted node patterns and a set of inputted node observers;

4   computing a set of target sub-node patterns for each inputted node pattern;

5   providing a node relationship graph (NRG) for the graph, wherein each node in the NRG

6   corresponds to a node in the graph;

7   computing a set of valid sub-node patterns for each node in the NRG;

8   systematically walking through nodes within the graph;

9   testing to determine if the target sub-node patterns for a node pattern matches the valid

10   sub-node patterns for a corresponding NRG node when a node is encountered in the graph; and

11   deactivating an identified graph observer for sub-nodes of an encountered node if none of

12   the target sub-node patterns associated with node patterns bound to the identified graph observer

13   match valid sub-node patterns.

1   15. The method of claim 14, comprising the further step of reactivating the identified graph

2   observer after the sub-nodes of the encountered node have been walked.

1   16. A program product stored on a recordable medium, which when executed, optimizes a graph

2   walking process of an inputted data graph based on inputted node patterns and a node

3   relationship graph (NRG) that corresponds to the inputted data graph, the program product

4   comprising:

5   means for generating a set of valid sub-node patterns for each node in the NRG;

6   means for generating a set of target sub-node patterns for each inputted node pattern;

7   means for systematically walking through nodes within the data graph and corresponding

8   nodes in the NRG; and

9   means for determining if the target sub-node patterns for a node pattern match the valid

10   sub-node patterns for a corresponding node in the NRG when a node is encountered in the data

11   graph.

1   17. The program product of claim 16, further comprising a first pruning system that can be

2   instructed by a node observer bound with an associated graph observer to deactivate the

3   associated graph observer for a set of sub-nodes when no matches occur between target sub-node

4   patterns and valid sub-node patterns.

1   18. The program product of claim 17, further comprising a second pruning system that can

2   instruct the graph processor not to walk the set of sub-nodes if all graph observers have been

3   deactivated.

1   19. The program product of claim 16, wherein the determining means includes a root node test,

2   wherein the root node test tests all target sub-node patterns.

1   20. The program product of claim 16, wherein the determining means includes a child node test,

2   wherein the child node test tests only target sub-node patterns associated with node patterns that

3   had at least one match in a parent node.